Notes on the osteology of the Arab horse with reference to a skeleton collected in Egypt by Sir Flinders Petrie

Juliet Clutton-Brock

Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, England

Richard Burleigh

Research Laboratory, British Museum, London WC1B 3DG, England

Synopsis

A horse skeleton from Egypt donated by Sir Flinders Petrie to the British Museum (Natural History) and previously assumed to be ancient has been shown by radiocarbon dating to be only about three to four hundred years old. As a result of this, the skeleton has acquired an altogether different importance as a rare source of comparative material relevant to the history and development of the Arab horse. Comparative measurements of the skeletons of two modern Arab horses show that these closely resemble the Petrie horse. Other valuable osteological material collected by Petrie is briefly discussed.

Introduction

Amongst the material in the osteology collections of the Mammal Section at the British Museum (Natural History) is the skeleton of a horse donated by Sir Flinders Petrie, probably at the beginning of this century. There is no documentation with the skeleton to give its historical age, date of collection or provenance beyond the fact of its having come from Egypt. The skeleton has recently been registered in the Museum's computer catalogue of archaeological animal remains as ARC 1977 5101.

The earliest evidence for the domestic horse in Ancient Egypt is at present the single skeleton from the Middle Kingdom fortress of Buhen in northern Sudan, dated historically to *circa* 1675 B.C. (Clutton-Brock, 1974), and there are in fact very few remains of horses even from later periods in Egypt. For this reason and because the Petrie skeleton is remarkably complete, except for the cranial region which is unfortunately fragmentary, we were anxious to establish its date and locality. The age could be determined by radiocarbon dating, but the locality has proved more elusive.

There appears to be no mention of the horse skeleton in any publication by Petrie, and we have examined all the relevant manuscripts and other records held by the Egypt Exploration Society and in the Petrie Museum of the Department of Egyptology at University College London. The documents in the Petrie Museum have been recently catalogued by Mrs Barbara Adams (1975, pp. 108–111) and include photocopies of original journals held at the Griffith Institute, Ashmolean Museum, Oxford, the other main repository of the Petrie archives. Unfortunately, we found no reference to the horse skeleton although there were several useful references to other animal remains held at the British Museum (Natural History).

Despite the absence of records we considered it justifiable to proceed with the radiocarbon dating in the hope that it would shed light on the early history of the horse in Egypt. To our initial dismay this date came out at only 328 radiocarbon years before the present, that is to the early seventeenth century A.D.

It took a little time to overcome our surprise at this result, and to become reconciled to the fact that we were no longer dealing with a specimen from Ancient Egypt, but we then realized that the skeleton has considerable intrinsic value. This is we believe the only well-dated skeleton

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Fig. 1 The Arab mare Ajjam with Lady Wentworth. (Photo: Special Press.)

of a horse that comes from the North African region, at a period when horses were beginning to undergo intensive improvement in Britain by cross-breeding with stock imported from the East. To anyone interested in the history of the Arab horse this skeleton should therefore be of value as comparative material, for it was in about A.D. 1689 that the first of the famous Arabs, Byerley Turk, arrived in England. As far as is known, there are no extant remains of the original imported Arab horses so we have not been able to make direct metrical comparisons with contemporary skeletons. However, detailed measurements have been recorded of the Petrie horse and compared with two Arab skeletons from the modern collections of the British Museum (Natural History) (Tables 1 and 2). One of these skeletons, No. 37.1.26.9, is of Ajjam, an Arab mare that died in 1937. Ajjam was owned by Lady Wentworth, who as is well known, was the daughter of Lady Anne Blunt, and had a world-famous stud of imported Arab stock at Crabbet Park in Sussex (Fig. 1).

We cannot be certain, of course, that the skeleton of the horse collected by Petrie in Egypt was of Arab breed, but it can be seen from the measurements that the bones bear a close resemblance to the two modern Arab skeletons.

Osteological description

The skeleton of the seventeenth century A.D. horse that was presented to the British Museum (Natural History) by Sir Flinders Petrie, was from an aged animal that was certainly more than 20 years old at the time of death, and may have been more than 30 years. The age was assessed

from the state of wear on the upper left corner and intermediate incisors (I^2 and I^3), these being the only incisor teeth present.

The skull and upper jaws of the horse only remain as comminuted fragments, but there is enough of the diastema region of the left maxilla and premaxilla to indicate that no canine tooth was present. There is therefore a high probability that the animal was female and this assertion is supported by the shape and proportions of the pelvic bones. The post-cranial bones are almost all present and are well enough preserved to enable measurements to be taken on each bone from either the left or right side of the skeleton. These measurements which were taken according to the method of von den Driesch (1976), are given in Table 1, whilst the dimensions of the lower cheek teeth are given separately in Table 2. Although most of the bones were complete, their condition was fragile so it was decided to impregnate them with polyvinyl acetate (PVA emulsion) to conserve them. This was carried out on the whole skeleton with the exception of the left humerus, some ribs and the right ulna which was destroyed for the radiocarbon determination.

When choosing modern comparative material to be measured against the Petrie horse we decided to take the skeleton of the Arab mare Ajjam (BM(NH) No. 37.1.26.9), although its skull was not available for measurement, and it was immediately apparent that the bones of the two specimens were very similar in their proportions. In addition an Arab stallion, Little Joker (BM(NH) No. H.40, presented by the Bombay Veterinary College in 1911), was selected for measurement and in this specimen the skull is complete so its gross dimensions are included in Table 1. The skull of the Petrie horse is unfortunately too fragmentary to allow any valid measurements to be recorded from it, but the mandible is complete except for the incisor region, so this may be compared with the mandible of the stallion, Little Joker. It can be seen that the lower teeth of the Petrie mare are considerably smaller than those of the stallion, but this is at least partly due to the greater age of the mare when it died and consequently the heavier wear on its cheek teeth. Although these teeth are much worn they are healthy and show no unevenness from biting on a bit.

The Petrie skeleton is from a large horse; it stood more than 15 hands (1509 mm) at the withers when it was alive (Table 1) and this is high, especially for a mare. The bones show that the animal was fine-limbed, and although it is not possible to tell the breed from an examination of the skeleton the proportions are close to those of the modern Arab mare and stallion that were taken as comparative material. The slenderness index of the metacarpal (Table 1) indicates that the Petrie mare was slightly more stockily built than the mare Ajjam, but only marginally more so than the stallion Little Joker, and in overall height she was taller than the stallion.

The numbers of vertebrae in the Petrie skeleton and the two comparative skeletons are as follows:

	Petrie mare	*Ajjam*	*Little Joker*
Cervical	7	7	7
Thoracic	18	18	17
Lumbar	5 (estimated)	5	6

The fifth lumbar vertebra is missing in the Petrie skeleton but it is evident from examination of the articular surfaces of the fourth lumbar and the sacrum that this mare only had five lumbar vertebrae. Stecher (1962) carried out a numerical survey of the numbers of vertebrae in the spines of modern horses, and he provided authoritative support for the contention of horsemen that the purebred Arab horse is 'short-coupled', that is, compared to other races of horses, it has a reduced number of vertebrae. Stecher found that the more usual number of six lumbar vertebrae was often reduced to five in Arab horses, and that if six lumbars were present then the thoracic vertebrae were reduced from the more usual 18 to 17. The two skeletons of Ajjam and Little Joker provide examples of these two alternative numberings, whilst that of the Petrie mare is consistent with the usual number found in the Arab breed.

In both Ajjam and Little Joker the two posterior lumbar vertebrae are fully ankylosed, indicating that both these horses were ridden extensively before they were fully mature. Although the Petrie mare was an aged animal when it died, there is no sign of ankylosis or other pathological condition in the spine which appears to be perfectly healthy. The rest of the skeleton of the Petrie

Table 1 Measurements of the Petrie horse skeleton together with those from male and female modern Arab horse skeletons. All measurements are in mm. Figures in brackets are estimates

	Designation as in von den Driesch (1976)	Petrie horse 77.5101 ♀	Ajjam 37.1.26.9 ♀	Little Joker H.40 ♂
Skull				
Basal length	**3**	–	–	482·0
Condylobasal length	**2**	–	–	510·0
Brow width (max.)	**41**	–	–	192·3
Breadth of cranium	**38**	–	–	99·0
Max. width occ. condyles	**34**	–	–	87·9
Max. A-P diameter of orbit	**31**	–	–	57·7
Max. D-V diameter of orbit	**32**	–	–	55·2
Mandible				
Length	**1**	–	–	386·2
Width of condyle	**–**	47·5	–	53·9
Depth of ramus between M_2–M_3	**–**	–	–	80·0
Height of vertical ramus	**19**	220·0	–	216·3
Atlas				
Max. width	GB	(140·3)	142·0	151·0
Axis				
Max. width of articular surface (ant.)	BFcr	86·1	87·6	91·5
Min. width of vertebra	SBV	43·6	48·5	52·7
Scapula				
Min. width of neck	SLC	67·3	66·7	66·1
Length of glenoid cavity	LG	58·0	62·0	64·0
Width of glenoid cavity	BG	44·0	51·2	49·4
Length of glenoid cavity + coronoid process	GLP	97·1	95·8	97·8
Height	HS	350·0	352·0	328·0
Humerus				
Length	GL	(310·0)	314·0	304·0
Lateral length	GLl	(310·0)	314·0	304·0
Distal width	BT	77·4	81·2	83·0
Radius				
Length	GL	358·0	368·0	351·0
Lateral length	GLl	351·0	350·0	337·0
Proximal width	BFp	76·3	80·4	81·4
Distal width	BFd	64·8	67·1	68·8
Min. width of shaft	SD	39·0	40·4	39·0
Ulna				
Length of head	LO	83·8	82·0	81·5
Width of articular surface	BPC	43·6	47·9	48·7
Metacarpal				
Length	GL	242·1	251·5	240·0
Lateral length	GLl	240·0	247·0	236·6
Proximal width	Bp	49·6	53·5	54·2
Distal width	Bd	53·1	50·3	53·7
Min. width of shaft	SD	33·9	32·3	32·3

Table 1 (*cont.*)

	Designation as in von den Driesch (1976)	Petrie horse 77.5101 ♀	Ajjam 37.1.26.9 ♀	Little Joker H.40 ♂
Pelvis				
Max. length of innominate bone	GL	(405·0)	445·0	410·0
Length of acetabulum	LAR	62·4	67·6	66·9
Femur				
Length	GL	(420·0)	436·0	411·0
Lateral length	GLl	(420·0)	436·0	411·0
Proximal width	Bp	(116·0)	127·2	126·9
Distal width	Bd	–	97·4	98·9
Min. width of shaft	SD	41·2	41·8	38·8
Tibia				
Length	GL	389·0	390·0	368·0
Lateral length	GLl	360·0	355·0	335·0
Proximal width	Bp	96·4	101·8	102·6
Distal width	Bd	76·3	76·7	80·2
Min. width of shaft	SD	41·9	40·7	40·1
Talus				
Length	GH	62·7	62·6	64·0
Greatest width	GB	62·3	65·7	65·0
Calcaneum				
Max. length	GL	118·0	118·7	114·7
Phalanx I Fore				
Length	GL	93·9	93·2	90·4
Proximal width	Bp	56·3	54·6	58·0
Proximal depth	Dp	38·4	37·4	37·3
Distal width	Bd	46·3	46·4	49·6
Min. width of shaft	SD	34·2	34·3	35·0
Phalanx I Hind				
Length	GL	90·5	88·3	88·9
Proximal width	Bp	56·0	56·6	57·2
Proximal depth	Dp	41·6	40·2	40·4
Distal width	Bd	42·2	45·2	46·0
Min. width of shaft	SD	32·2	33·4	33·4
Phalanx II Fore				
Length	GL	49·4	44·5	49·0
Proximal width	Bp	54·2	52·9	54·5
Proximal depth	Dp	32·1	31·3	32·4
Phalanx II Hind				
Length	GL	51·4	46·9	50·0
Proximal width	Bp	53·6	52·5	54·9
Proximal depth	Dp	34·2	32·6	33·3

Table 1 (*cont.*)

	Designation as in von den Driesch (1976)	Petrie horse 77.5101 ♀	Ajjam 37.1.26.9 ♀	Little Joker H.40 ♂
Phalanx III Fore				
Length	GL	(60·9)	67·5	74·8
Width	GB	(83·7)	74·1	79·3
Height in region of extensor process	HP	(41·7)	47·8	36·6
Phalanx III Hind				
Length	GL	68·9	62·9	66·1
Width	GB	72·8	71·0	75·3
Height in region of extensor process	HP	47·7	45·8	38·0
Metatarsal				
Length	GL	288·3	300·0	288·5
Lateral length	GLl	285·4	295·0	282·3
Proximal width	Bp	53·5	55·3	55·0
Distal width	Dp	50·3	51·0	53·7
Min. width of shaft	SD	31·2	30·6	28·8
Sacrum				
Max. width of wings	GB	230·7	226·0	200·0
Length of body of sacrum without first caudal vertebra	PL	206·4	194·2	179·0
Slenderness index of metacarpal				
Min. width of shaft × 100/length	–	14·00	12·84	13·45
Estimate of withers height:				
Humerus				
Lateral length × 4·87	–	1509·7	1529·2	1480·5
Metacarpal				
Lateral length × 6·41	–	1538·4	1583·3	1516·6

Note: In Britain the withers height of living horses is usually measured by 'hands'. One hand = 101·6 mm.

mare is also healthy with the exception of the extensive exostoses on the mandible, described in the appendix below (see also Figs 2 and 3). Moreover, the hoof cores and anterior phalanges show no signs of the animal having been ridden or driven over hard ground, as is usual in aged horses that have been kept in primitive conditions and overworked.

As we have not been able to discover, up to now, how this mare came to be buried nor why it was later excavated by Sir Flinders Petrie and brought to England we can only speculate on its origins, but at least the healthy condition of the spine and limb bones does indicate that it was unlikely to have been a common beast of burden. One further small piece of evidence on its demise is provided by the tufa-like matrix that surrounded the fragments of skull. This is almost entirely composed of the casts of great numbers of fly larvae and pupae which have been identified by Mr K. G. V. Smith of the Department of Entomology, British Museum (Natural History) as belonging to *Chrysomya albiceps* (Wiedemann). This fly is found all over Africa and is a common feeder on carrion which means that the head of the mare must have been exposed to the open air, shortly after death, for long enough to become a breeding ground for flies that were later sealed in with sand or silt.

Table 2 Measurements of the lower teeth of the Petrie horse compared with the modern Arab male, H.40

	Designation as in von den Driesch (1976)	Petrie horse 77.5101 ♀	Little Joker H.40 ♂
Lower teeth			
Length of cheek teeth row	6a	160·0	162·2
Length of premolar row	8a	76·5	86·6
Length of molar row	7a	77·7	78·3
Length P_2	L	(28·0)	33·8
Width P_2	B	17·2	18·6
Length P_3	L	24·8	27·5
Width P_3	B	16·3	22·2
Length P_4	L	24·3	25·9
Width P_4	B	17·2	20·8
Length M_1	L	22·7	24·0
Width M_1	B	18·1	19·1
Length M_2	L	24·3	24·3
Width M_2	B	16·5	16·6
Length M_3	L	32·0	31.0
Width M_3	B	13·3	15·3

Dating

As mentioned above the right ulna of the horse was sacrificed to provide a sample for radiocarbon dating. The most reliable part of bone for radiocarbon dating purposes is collagen, the protein constituent, as dates on whole bones almost invariably prove to be too young. For this reason the olecranon process of the right ulna was first completely demineralized with dilute hydrochloric acid. A quantity of well-preserved, uncontaminated collagen was obtained which was converted chemically to benzene for measurement of ^{14}C activity by the liquid scintillation counting method. From this measurement the following date was obtained:

BM-1357. 328 ± 52 bp (ad 1622)

This result is expressed in radiocarbon years before A.D. 1950 on the basis of the 5570 year half-life, the normal mode of reporting dates at present. Thus the bp/ad notation indicates that this date has not been corrected for the known differences between radiocarbon and calendar years. These differences are not large in the period in which the date falls but the true calendar date to which it is approximately equivalent will be some 80 years earlier, that is about A.D. 1540. This corrected date has in turn an estimated error of about ± 75 years at the level of one standard deviation.

Discussion

Although we do not know the reasons for the recovery of the skeleton of the horse or whether or not Petrie believed that it was ancient, it is not altogether surprising that he apparently kept no record. By comparison with the splendour and interest of the objects that Petrie uncovered in the

Fig. 2 Lingual side of left mandibular ramus of the Petrie horse showing extent of exostosis. (Photo: Royal Veterinary College.)

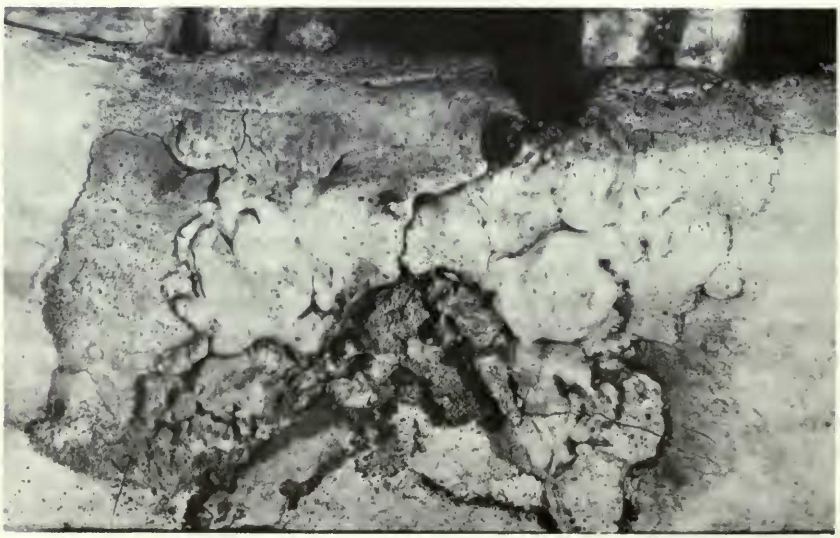

Fig. 3 Petrie horse. Detailed view of exostosis on ramus. (Photo: Royal Veterinary College.)

course of his excavations and of which he often wrote eloquently in his journals, the animal remains must have seemed commonplace and, though in many instances worthy of retention, unworthy of special note. Similarly, the important botanical materials that Petrie found, some of which are also in the collections of the British Museum (Natural History), appear to have received scant mention in his records. It is perhaps difficult to comprehend this today, with the present emphasis on reconstruction of the environment and economy of earlier human populations from exactly this kind of evidence rather than from the more material remains. Such a commentary takes no account of course of the scale of Petrie's work, its pioneer character, the huge and important collections that he made and distributed to museums in many parts of the world, and the immense volume of material that he published over a long life of ceaseless work. He was in fact one of the principal founders of modern archaeology. Fortunately he did record some of the skeletal material he found as exemplified by the following passage from *Gizeh and Rifeh* (Petrie, 1907):

> In the cemetery some tombs full of animals' skeletons were found. All the skulls in good state were preserved, and sent to the British Museum (Natural History). Mr. Oldfield Thomas has kindly given the following report upon them: "The skulls form a wonderfully fine set, which will no doubt prove of great value when some one arises with time and taste to work out such things in detail. I never saw so fine a series before. There are 192 cats' skulls, mostly *Felis ocreata*, but no doubt some are *F. chaus*. They are, however, a wonderfully varying lot, and would require much work for every one to be certainly and exactly determined. One might believe that the Ancient Egyptians had as many different kinds as we have now. Also 7 mongoose skulls (*Mungos ichneumon*), 3 wild-dog (*Canis lupaster*), and 1 fox (*Vulpes famelica*)."

The series of 192 cats' skulls was later described by Morrison-Scott (1952) but the rest of the collections presented by Petrie to the British Museum (Natural History) remain to be studied. Although much of this material lacks documentation we are optimistic that further information may yet come to light. We intend to subject more specimens to radiocarbon dating in the belief that this will yield interesting results and contribute to our knowledge of the history of domesticated animals in Egypt. Petrie died in 1942, a decade before the advent of radiocarbon dating but doubtless its application to material he collected would have greatly interested and gratified him. The continuing need to retain excavated skeletal material for possible future investigation cannot be overstressed. In the present instance, the precise dating of the horse skeleton has endowed it with a scientific value which Sir Flinders Petrie would have been the first to applaud.

Appendix

Pathological examination of the mandible of the Petrie horse

A region of prominent exostosis on the left mandibular ramus of the horse (Figs 2 and 3) was kindly examined for us by Dr E. C. Appleby of the Pathology Department, Royal Veterinary College, London, who reported as follows:

> Part of the mineralized material forming a plaque on the mandibular surface near the base of the cheek teeth was removed and decalcified for histological examination. This revealed a trabecular structure suggestive of new, superficial bone growth possibly overlying a lesion deeper in the bone. The exostosis appears to have been inflammatory in origin and may have been the result of an abscess at the base of a tooth or perhaps due to traumatic or other injury to the periosteum. Somewhat similar, but much smaller, deposits elsewhere on the mandible were not examined histologically. The condition had evidently been established for some weeks. Bone changes of this kind are not uncommon in horses although usually associated with chronic degenerative diseases of the joints rather than present in the facial region. Lesions on the mandible of horses can occur as part of a generalized skeletal change associated with space-occupying lesions in the chest (acropachia) but, as stated in the main text above, in this case all the other surviving bones of the horse were healthy in appearance.

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